IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| In re Application of: Clark R. Baker, Jr. | § | Confirmation No.: | 1106 |
| Serial No.: 10/796,584 | § | Group Art Unit: | 3737 |
| Filed: March 8, 2004 | § | Examiner: | Ramirez, John Fernando |
| For: Method and Apparatus for Optical Detection of Mixed Venous and Arterial Blood Pulsation in Tissue | § | Atty. Docket: | TYHC:0149/FLE/POW P0409R |

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September 22, 2010
Date

Kristi Tran-Chin

## APPEAL BRIEF PURSUANT TO 37 C.F.R. §§ 41.31 AND 41.37

This Appeal Brief is being filed in furtherance of the Notice of Appeal submitted concurrently with this Appeal Brief. It should be noted that Appellant previously filed a Notice of Appeal that was received by the U.S.P.T.O. on October 27, 2007. Further, an Appeal Brief was previously filed by Appellant and received by the U.S.P.T.O. on February 4, 2008. A fee of $510.00 was paid for each of the Notice of Appeal and the Appeal Brief. However, before a final decision was reached by the Board, prosecution was reopened. In accordance with M.P.E.P. § 1204.01, Appellant is requesting that the previous appeal be reinstated after prosecution was reopened. Specifically, Appellant requests that the previously paid appeal fees be applied to the new appeal on the same application. The fees have changed to $540.00 for each of the Notice of Appeal and the Appeal Brief. Accordingly, the Commissioner is authorized to charge the difference of $60.00, and any additional fees that may be required, to the credit card listed on the attached PTO-2038. However, if the PTO-2038 is missing, if the amount listed thereon is insufficient, or if the amount is unable to be charged to the credit card for any other reason, the Commissioner is authorized to charge Deposit Account No. 06-1315; Order No. TYHC:0149 (P0409R).

Adjustment date: 09/29/2010 HDESTA1
02/05/2008 INTEFSW 00011105 10796584
01 FC:1402 -510.00 OP

09/29/2010 HDESTA1 00000043 10796584
01 FC:1402 540.00 OP

## 1. REAL PARTY IN INTEREST

The real party in interest is Covidien, the Assignee of the above-referenced application by virtue of the Assignment to Nellcor Puritan Bennett LLC, a subsidiary of Covidien, recorded at reel 015602, frame 0416, and dated July 26, 2004. Accordingly, Covidien, as the parent company of the Assignee of the above-referenced application, will be directly affected by the Board's decision in the pending appeal.

## 2. RELATED APPEALS AND INTERFERENCES

Appellant is unaware of any other appeals or interferences related to this Appeal. The undersigned is Appellant's legal representative in this Appeal.

## 3. STATUS OF CLAIMS

Claims 1-27 are currently pending. Claims 1-4, 6-16, and 18-22 are currently rejected and, thus, are the subject of this Appeal. The Examiner indicated that claims 5 and 17 include allowable subject matter, and claims 23-27 are withdrawn.

## 4. STATUS OF AMENDMENTS

The claim amendments submitted in the Amendment and Response to Office Action mailed on November 5, 2005, have been entered, and no subsequent amendments were submitted. Therefore, the present application is not subject to any pending amendments.

## 5. SUMMARY OF CLAIMED SUBJECT MATTER

This Appeal Brief addresses independent claims 1 and 13 and the claims depending therefrom. Below, Appellant explains each of the independent claims by identifying specific embodiments in the specification. While these embodiments exemplify the subject matter of the appealed claims, they do not necessarily define the claims' scope. Thus, these claims should not be construed as limited to the following embodiments by virtue of this explanation.

The present invention relates generally to the field of pulse oximetry, and in particular to the processing of signals generated by a pulse oximeter to detect the presence of a phenomenon known as "venous pulsation." Specification, page 1, lines 5-6 and 23-25. In pulse oximetry, venous pulsation may interfere with the calculation of various physiological parameters, such as oxygen saturation or pulse rate. Specification, page 9, lines 23-28. Venous pulsation is generally believed to be caused by venous blood backing up and pooling due to a lack of sufficient valves in the vascular anatomy. Specification, page 9, lines 18-22. Venous pulsation is more common in certain areas of the body where there are fewer valves, such as the head or forehead. *Id.* In addition, a patient's medical condition may increase the likelihood that venous pulsation will occur. *Id.* Typically, caregivers are instructed to secure sensors to patients tightly enough to overcome any venous pulsation, but it is not easy to determine whether any particular sensor has been secured properly. Specification, page 9, lines 31-34. Venous pulsation is distinguishable from motion artifact, in part, because it may occur *absent patient motion. See* Specification, page 9, lines 29-30. Accordingly, the present application is directed to detecting the presence of *venous pulsation* so that a caregiver may be notified and take measures to preclude the presence of further venous pulsations (e.g., by tightening the sensor on the patient).

With regard to the aspect of the invention set forth in independent claim 1, discussions of the recited features of claim 1 can be found at least in the below cited locations of the specification and drawings. By way of example, a method of detecting the presence of mixed venous and arterial blood pulsation in tissue includes receiving first and second electromagnetic radiation signals (*see, e.g.,* Specification, page 3, line 33 – page 4, line 1; FIG. 1, detector 114) from a blood perfused tissue portion (*see, e.g., id.*; FIG. 1, patient 112) corresponding to infrared and red wavelengths of light (*see, e.g.,* Specification, page 3, lines 11-14; page 5, lines 20-22; FIG. 1, light source 110); obtaining a measure of a phase difference between the first and second electromagnetic radiation signals (*see, e.g.,* Specification, page 10, line 11 – page 12, line 17; page 12, line 29 – page 13, line 2; FIGS. 3A and 3B); comparing the measure with a threshold value to form a comparison (*see, e.g.,* Specification, page 12, lines 19-28); detecting the presence or absence of venous pulsation using the comparison (*see, e.g.,* Specification, page 12, lines 19-20; page 13, lines 3-9; FIG.

4); and indicating the presence of venous pulsation to a caregiver if venous pulsation is present (*see, e.g.,* Specification, page 13, lines 13-21).

With regard to the aspect of the invention set forth in independent claim 13, discussions of the recited features of claim 13 can be found at least in the below cited locations of the specification and drawings. By way of example, a device for detecting the presence of mixed venous and arterial blood pulsation in tissue includes means for receiving first and second electromagnetic radiation signals (*see, e.g.,* Specification, page 3, line 33 – page 4, line 1; FIG. 1, detector 114) from a blood perfused tissue portion (*see, e.g., id.*; FIG. 1, patient 112) corresponding to infrared and red wavelengths of light (*see, e.g.,* Specification, page 3, lines 11-14; page 5, lines 20-22; FIG. 1, light source 110); means for obtaining a measure of a phase difference between the first and second electromagnetic radiation signals (*see, e.g.,* Specification, page 10, line 11 – page 12, line 17; page 12, line 29 – page 13, line 2; FIGS. 3A and 3B); means for comparing the measure with a threshold value to form a comparison (*see, e.g.,* Specification, page 12, lines 19-28); means for detecting the presence or absence of venous pulsation using the comparison (*see, e.g.,* Specification, page 12, lines 19-20; page 13, lines 3-9; FIG. 4); and means for indicating the presence of venous pulsation to a caregiver when venous pulsation is present (*see, e.g.,* Specification, page 13, lines 13-21).

A benefit of the invention, as recited in these claims, is the ability to detect the presence of venous pulsation in a pulse oximetry signal and inform a caregiver of the presence of venous pulsation when detected. This is a clear difference and distinction from the prior art, as discussed below.

## 6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

### A. Ground of Rejection for Review on Appeal

Appellant respectfully urges the Board to review and reverse the Examiner's only ground of rejection in which the Examiner rejected claims 1-4, 6-16, and 18-22 under 35 U.S.C. § 103(a) as being obvious over U.S. Pub. No. 2003/0036689 to Diab et al. ("Diab") in view of U.S. Pat. No. 5,662,106 to Swedlow et al. ("Swedlow") and in further view of non-patent literature "Masimo Signal Extraction Pulse Oximetry" ("Masimo").

## 7. ARGUMENT

As discussed in detail below, the Examiner has improperly rejected the pending claims. Further, the Examiner has misapplied long-standing and binding legal precedents and principles in rejecting the claims under 35 U.S.C. § 103. Accordingly, Appellant respectfully requests full and favorable consideration by the Board, as Appellant strongly believes that claims 1-4, 6-16, and 18-22 are currently in condition for allowance.

### A. Ground of Rejection

In the Office Action issued on July 9, 2010 ("Office Action"), the Examiner rejected claims 1-4, 6-16, and 18-22 under 35 U.S.C. § 103(a) as obvious over Diab in view of Swedlow and further in view of Masimo. Specifically, the Examiner stated the following:

> With respect to claims 1-4, 6-16, 18-22, the Diab et al. patent teaches a system for detecting the presence of mixed venous and arterial blood pulsation in tissue, (abstract, paragraph 0019), obtaining a measure of a phase difference between said first and second electromagnetic radiation signals (paragraphs 0389-0391, fig. 25B, elements 694, 692, 690), comparing said measure with a threshold value to form a comparison (paragraph 0387, fig. 25B, elements 660, 662, 696); and detecting the presence or absence of venous pulsation using said comparison (paragraphs 0019, 0368). (NOTE: it is well known in the art that the primary cause of noise in transmissive pulse oximetry measurements is motion artifact caused by the movement of venous blood in the finger ...).
>
> Diab et al. do not disclose indicating the presence of venous pulsation to a caregiver if venous pulsation is present. However, the Swedlow et al. patent teaches an indication of the presence of venous pulsation to a caregiver if venous pulsation is present (see abstract, fig. 1, element 30, and figure 4, col. 5, line 64 – col. 6, line 34).
>
> It would have been obvious for a person of ordinary skill in the art, to modify the system disclosed by Diab et al., with the above discussed enhancements because such modification would provide a more accurate blood oxygen and pulse readings.
>
> Office Action, pp. 4-5 (emphasis in original).

Appellant respectfully traverses this rejection. The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214

U.S.P.Q. 735 (B.P.A.I. 1979). To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 U.S.P.Q. 580 (C.C.P.A. 1974). However, it is not enough to show that all the elements exist in the prior art since a claimed invention composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. *KSR International Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007). It is important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. *Id.* Specifically, there must be some articulated reasoning with a rational underpinning to support a conclusion of obviousness; a conclusory statement will not suffice. *In re Kahn,* 441 F.3d 977, 988 (Fed. Cir. 2006). Indeed, the factual inquiry determining whether to combine references must be thorough and searching, and it must be based on *objective evidence of record. See In re Lee,* 61 U.S.P.Q.2d 1430, 1436 (Fed. Cir. 2002).

As has been asserted throughout prosecution, neither Diab nor Swedlow discusses detecting *venous pulsation* or indicating the presence of venous pulsation to a caregiver when detected, as recited in independent claims 1 and 13. However, the Examiner argued that Diab and Swedlow teach these limitations because "it is well known in the art that the primary cause of noise in transmissive pulse oximetry measurements is *motion artifact* caused by the *movement of venous blood* in the finger." Office Action, p. 4 (emphasis added). However, Appellant asserts that venous blood movement is not the primary cause for motion artifact. Further, movement of venous blood caused by patient motion is not venous pulsation. Appellant has challenged such assertions throughout prosecution because they are clearly erroneous. Further, Appellant has asked that the Examiner provide support for such assertions. The Examiner has now asserted that this allegedly well known fact is supported by Masimo. The deficiencies of all of the cited references will be discussed in detail below.

Contrary to the Examiner's assertions, Diab and Swedlow do not discuss *venous pulsation.* The central dispute between the Examiner and the Appellant seems to be based on the meaning of the term "venous pulsation," as recited in independent claims 1 and 13 and as described in the present application. As discussed in the present application, venous pulsation is a phenomenon in pulse oximetry which may interfere with the calculation of

various physiological parameters, such as oxygen saturation or pulse rate. Specification, ¶ [0038]. Venous pulsation is generally believed to be caused by venous blood backing up and pooling due to a lack of sufficient valves in the vascular anatomy. *Id.* Venous pulsation is more common in certain areas of the body where there are fewer valves, such as the head or forehead. *Id.* In addition, a patient's medical condition may increase the likelihood that venous pulsation will occur. *Id.* Typically, caregivers are instructed to secure sensors to patients tightly enough to overcome any venous pulsation, but it is not easy to determine whether any particular sensor has been secured properly. *Id.*, ¶ [0039]. Venous pulsation is a *different phenomenon* from motion artifact, which may be caused by patient movement, such as shivering, finger tapping, waving, and so forth. Motion artifact can be caused by movement of the patient relative to the sensor, "such as by the detector moving away from the skin temporarily," and essentially has nothing to do with venous pulsation. Swedlow, col. 2, lines 14-15. Indeed, a patient who is lying *perfectly still* may experience venous pulsations.

In contrast to the present claims, Diab discloses a system where the *venous saturation* is quantified. Specifically, Diab discloses calculation of an arterial *saturation* and a venous *saturation*. *See* Diab, ¶ [0395]. To measure the venous saturation, Diab uses arterial saturation values, and the venous saturation measurement appears to derive from arterial saturation measurements. *See id.* The Diab reference explains:

> In order to obtain the venous *saturation*, the minimum arterial *saturation* value, of points that exhibit non-zero value, is selected rather than the maximum arterial *saturation* value. The *saturation* can be provided to the display 336.

*Id.* (emphasis added).

Regarding paragraph [0019] of Diab, which the Examiner cited on page 4 of the Office Action, Diab discloses that a plethysmographic wave contains primary and secondary portions. *See* Diab, ¶ [0019]. The secondary portion is noise and may include *several parameters*, including patient movement, venous blood contribution to attenuation of energy as it passes through the body, and respiration. *See id.* A parameter "n" utilized in algorithms disclosed in Diab represents noise, including "information on the venous blood, *as well as*

*motion artifacts and other noise*." Diab, ¶ [0368] (emphasis added). Appellant stresses that the sources of noise in the secondary portion of the plethysmographic wave *are not sorted or specifically identified.* Diab does not disclose a method or means for detecting *venous pulsation* but rather discloses that a portion of the plethysmographic wave may include a hodgepodge of *various* noise signals. That is, the secondary portion of the plethysmographic wave contains a variety of noise and *may or may not* contain noise due to venous pulsation. Diab does *not* appear to specifically address venous pulsation at any point. Rather, Diab merely appears to discuss venous blood and indicates that *motion* may cause venous blood to flow in an unpredictable manner, which is not venous pulsation.

Claim 1 of the present application recites "obtaining a measure of a phase difference ... comparing the measure with a threshold ... detecting the presence or absence of venous pulsation using the comparison." Claim 13 recites "means for obtaining a measure of a phase difference ... means for comparing the measure with a threshold ... means for detecting the presence or absence of venous pulsation using the comparison." Regarding the phase difference measurement recited in claims 1 and 13, Diab discusses a type of phase difference measurement between red and IR signals; however, this measurement is not obtained to form a comparison with a threshold to *detect the presence of venous pulsation. See* Diab, ¶¶ [0389]-[0393]. Rather, according to Diab, if the phase difference between a red and IR point is low enough, the points are used to calculate a *saturation value. See* Diab, ¶¶ [0393]-[0394]. That is, Diab discloses calculation of arterial and venous *saturation. See* Diab, ¶ [0395]. Appellant finds no discussion in Diab regarding detecting the presence or absence of a *venous pulsation.*

Furthermore, Swedlow does not cure the deficiencies of Diab. Swedlow discloses modification of an alarm condition when *motion* is detected. *See* Swedlow, Abstract. *Nothing* in Swedlow discloses detection of *venous pulsation,* much less an indication of its presence. Rather, Swedlow merely discloses a pulse oximeter that detects *motion artifacts. See* Swedlow, col. 1, lines 10-13; col. 2, lines 52-53; col. 5, line 64 – col. 6, line 14. Specifically, Swedlow relates to detection of a motion artifact, "such as by the detector moving away from the skin temporarily." Swedlow, col. 2, lines 14-15. Again, a motion

artifact is not equivalent to venous pulsation as recited in the present claims. Accordingly, detection of motion artifacts *does not teach detection of venous pulsations.*

Despite the complete lack of any discussion regarding detecting the presence or absence of *venous pulsation* in either Diab or Swedlow, the Examiner continues to assert that claims 1 and 13 are obvious in view of these references. Specifically, the Examiner relied on the allegedly "well known fact" that "the primary cause of noise in transmissive pulse oximetry measurements is motion artifact caused by the movement of venous blood in the finger." Office Action, p. 4. As support for the allegedly "well known fact," the Examiner cited Masimo.

It remains unclear to the Appellant exactly how the Examiner believes the cited references support the assertion that the primary cause of noise in transmissive pulse oximetry measurements is motion artifact caused by the movement of venous blood in the finger. For example, in the Office Action, the Examiner explicitly stated the following:

> Considering the finger for example, the venous blood in the vascular bed will be easily deformed during motion. In addition, the venous blood is a strong absorber of light. Hence, it can represent a significant contributor to the total optical density during motion episodes. During routine patient motions (shivering, waving, tapping, etc.), the resulting noise can be quite substantial and can easily overwhelm a conventional ratio based oximetry system. Having identified the venous blood as a significant contributor to noise during motion.

*Id.*, p. 3. It appears that the Examiner has asserted that, because venous blood is deformed during motion, detection of motion artifact is equivalent to detecting venous pulsation. This understanding of the Examiner's position seems to be supported by the conversation during the interview between Appellant's representative and the Examiner on December 22, 2008. Indeed, Appellant's representative pointed out that the evidence submitted by the Examiner in support of the alleged "well known facts" relied upon in the rejection under 35 U.S.C. § 103(a) did not demonstrate that motion artifact and venous pulsation are equivalent or interchangeable phenomena. *See* Interview Summary. In response, the Examiner stated that the argument set forth on page 6 of the Examiner's Answer did not mention venous pulsation.

*See id.* Appellant's representative reminded the Examiner that the present claims are directed to detection of venous *pulsations* and therefore the Examiner's statement was confusing. *See id.* Accordingly, Appellant stresses that venous pulsation is not equivalent to motion artifact and directs the Board's attention to the discussion of the meaning of venous pulsation and motion artifact set forth above, which is supported not only by the present application but also by the cited references. For example, Swedlow suggests that motion artifact results from motion of the detector relative to the tissue, such as "the detector moving away from the skin temporarily," and does not even mention venous pulsation. Similarly, motion that causes venous blood to flow unpredictably, as discussed in Diab, is also not venous pulsation. Indeed, venous pulsation is a well known term of art that one of ordinary skill in the art would certainly not confuse with the motion artifact discussed in the cited references.

Even if it was a well known fact at the time of Appellant's invention that venous blood is deformed during motion and so forth, this information does not obviate the deficiencies of Diab and Swedlow. Indeed, venous blood *deformation* caused by *patient motion* is not the same as venous *pulsations*. Even the reference the Examiner relied upon in support of the assertion of "well known facts" merely discloses that "*during patient motion, movement of non-arterial components* (for example, venous blood) *can be identified* as additional saturation components." Masimo, p. 476 (emphasis added). This is apparently merely directed to identification of the "movement of non-arterial components," which may include venous blood. This is *not* directed to detecting the presence or absence of *venous pulsation*. In fact, it is apparent that Masimo is directed to identifying a "correct *arterial saturation*." *Id.*, p. 477 (emphasis added). Further, to the extent that Masimo relates to venous pulsation in any way, it does not appear to be detecting the presence or absence of venous pulsation. Rather, at best, it might be considered to be lumping venous pulsation into a general category of noise. Again, motion artifact and venous pulsation are not the same phenomenon, and detection of one does not constitute detection of the other.

In summary, neither Diab nor Swedlow disclose "detecting the presence or absence of venous pulsation," as recited in independent claims 1 and 13. Additionally, neither reference discloses "indicating the presence of venous pulsation to a caregiver if venous pulsation is present." The "well known facts" asserted by the Examiner fail to obviate the deficiencies of

the cited references. Even if it was well known at the time of Appellant's invention that "the primary cause of noise in transmissive pulse oximetry measurements is motion artifact caused by the movement of venous blood in the finger," which Appellant does not concede, this alleged fact would not render the present claims obvious over references relating to motion artifact. Motion artifact, whether it is considered to be movement of the sensor away from the patient and/or disrupted flow of blood within the patient caused by patient motion, is not the same as venous pulsation. That is, the presence of *motion artifact* (i.e., noise due to patient movement) does not indicate the presence of *venous pulsation* (i.e., a phenomenon which can be present without any patient movement), or vice versa. In view of the above arguments, Appellant respectfully requests that the Board withdraw the rejection under 35 U.S.C. § 103 and provide an indication of allowance for all pending claims.

Appellant submits that the claims depending from independent claims 1 and 13 are patentable at least based on their dependencies from allowable based claims. In addition, the dependent claims recite unique features not disclosed in Diab, Swedlow, or Masimo. Accordingly, Appellant respectfully submits that the Examiner's rejection of dependent claims 2-4, 6-12, 14-16, and 18-22 is in error.

For example, dependent claim 2 recites "filtering the first and second electromagnetic radiation signals before the obtaining the measure, to pass portions of the first and second electromagnetic radiation signals *having frequencies at or near the pulse rate or harmonics of the pulse rate* of the blood perfused tissue." (Emphasis added). Dependent claim 14 contains similar language. The Examiner alleged the features of claim 2 are disclosed in paragraphs [0329] and [0385] of Diab. However, these paragraphs merely appear to generally discuss a spectrum analysis module 590 and utilization of a complex FFT, which upon further review includes utilization of high-pass filter modules 645, 647. However, Diab does not disclose that the infrared and red high-pass filter modules 645, 647 pass portions of the radiation signals with specific frequencies related to the patient's pulse rate, as recited in claims 2 and 14.

Dependent claim 3 recites "*obtaining a measure of a persistent phase difference* between the first and second electromagnetic radiation signals." (Emphasis added).

Dependent claim 15 recites similar language. With regard to these features, the Examiner merely asserted that "in figures 26-30 the measurement of both signals red and infrared, in which each of the signals is relatively undisturbed by motion artifact over a time period (pars. 0411-0414)." Office Action, p. 5. It is not clear to Appellant that the cited portions of Diab disclose what the Examiner alleges. However, even if the cited portion of Diab does disclose signals undisturbed by motion artifact, the presence of undisturbed red and infrared signals is not the same as "obtaining a measure of a persistent phase difference." Accordingly, the cited references are deficient with regard to the recitations of dependent claims 3 and 15.

Dependent claim 4 recites "integrating the measure of a phase difference over a time period," and dependent claim 16 recites similar language. The Examiner merely lumped claims 4 and 16 together with claims 3 and 15 in the remarks set forth on page 5 of the Office Action. Accordingly, the Examiner's current position with regard to claims 4 and 16 is unclear. Indeed, it appears the Examiner did not specifically address claims 4 and 16 in the Office Action. Accordingly, based on previous arguments by the Examiner, which cited the phase difference module 694, Appellant stresses that nothing in the Diab reference discloses integrating the phase difference calculated in the phase difference module 694.

Dependent claim 6 recites "analyzing a cross-correlation function of the first and second electromagnetic radiation signals, as a function of a delay interval between them," and dependent claim 18 recites similar language. Diab states that a cross-correlation output "indicates a cross-correlation between the red and infrared signals." Diab, ¶ [0270]. Further, Diab discloses that "a signal processor acquires a first measured signal and a second measured signal that is correlated to the first measured signal." Diab, ¶ [0014]. However, there is no indication that this cross-correlation function is analyzed as a function of a delay interval between the radiation signals required by in claims 6 and 18.

Dependent claim 8 recites "taking the complex conjugate of the first and second electromagnetic radiation signals, and dividing the complex conjugate by the product of the magnitudes of the first and second electromagnetic radiation signals." Dependent claim 20 recites similar language. Nothing in the cited reference discloses the claimed limitations of taking the complex conjugate and dividing the complex conjugate by the product of the

magnitudes of the radiation signals as recited in claims 8 and 20. The Examiner merely asserted that this is an obvious design choice. Essentially, the Examiner has taken Official Notice of facts outside of the record that the Examiner apparently believes are capable of demonstration as being "well-known" in the art. Therefore, in accordance with M.P.E.P. § 2144.03, the Appellant hereby seasonably traverses and challenges the Examiner's use of Official Notice. Appellant strongly disagrees with the Examiner's position and asserts that the Examiner has clearly failed to provide references that disclose all of the recited features of claims 8 and 20.

Dependent claim 12 recites "providing a notification of the presence of venous pulsation," and dependent claim 22 recites similar language. As discussed above in relation to the independent claims 1 and 13, neither the Diab reference nor the Swedlow reference, nor a theoretical combination thereof, discloses "indicating the presence of venous pulsation" when present. It appears that the Examiner did not even specifically address claims 12 and 22 in the Office Action. Regardless, as the cited references do not disclose indicating the presence of venous pulsation, they clearly do not disclose providing notification of such a presence. Accordingly, the cited references do not disclose the limitations set for in claims 12 and 22.

Again, Appellant respectfully submits that dependent claims 2-4, 6-12, 14-16, and 18-22 are allowable based at least on their dependence from allowable base claims 1 and 13. Further, the Examiner has not set forth a *prima facie* case of obviousness regarding these dependent claims. Indeed, the dependent claims clearly contain features not disclosed by the cited references. The Examiner has already indicated that dependent claims 5 and 17 contain allowable subject matter. Accordingly, for at least the reasons set forth above, Appellant respectfully requests the Board overturn the rejection of dependent claims 2-4, 6-12, 14-16, and 18-22 under 35 U.S.C. § 103.

## 8. CONCLUSION

Appellant respectfully submits that all pending claims are in condition for allowance. However, if the Examiner or Board wishes to resolve any other issues by way of a telephone conference, the Examiner or Board is kindly invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

Date: September 22, 2010

W. Allen Powell
Reg. No. 56,743
FLETCHER YODER
P.O. Box 692289
Houston, TX 77269-2289
(281) 970-4545

## 9. APPENDIX OF CLAIMS ON APPEAL

### A. Listing of Claims:

1. A method of detecting the presence of mixed venous and arterial blood pulsation in tissue, comprising:

receiving first and second electromagnetic radiation signals from a blood perfused tissue portion corresponding to infrared and red wavelengths of light;

obtaining a measure of a phase difference between the first and second electromagnetic radiation signals;

comparing the measure with a threshold value to form a comparison;

detecting the presence or absence of venous pulsation using the comparison; and

indicating the presence of venous pulsation to a caregiver if venous pulsation is present.

2. The method of claim 1 comprising filtering the first and second electromagnetic radiation signals before the obtaining the measure, to pass portions of the first and second electromagnetic radiation signals having frequencies at or near the pulse rate or harmonics of the pulse rate of the blood perfused tissue.

3. The method of claim 1 wherein the obtaining a measure of a phase difference between the first and second electromagnetic radiation signals comprises obtaining a measure of a persistent phase difference between the first and second electromagnetic radiation signals.

4. The method of claim 3 wherein the obtaining a measure of a persistent phase difference comprises integrating the measure of a phase difference over a time period.

6. The method of claim 1 wherein the obtaining a measure of a phase difference comprises analyzing a cross-correlation function of the first and second electromagnetic radiation signals, as a function of a delay interval between them.

7. The method of claim 1 wherein the obtaining a measure of a phase difference comprises a frequency domain analysis and subtracting the phases of the first and second electromagnetic radiation signals at a frequency.

8. The method of claim 7 wherein the subtracting the phases of the first and second electromagnetic radiation signals comprises taking the complex conjugate of the first and second electromagnetic radiation signals, and dividing the complex conjugate by the product of the magnitudes of the first and second electromagnetic radiation signals.

9. The method of claim 1 wherein the obtaining a measure of a phase difference comprises obtaining the measure of a phase difference at or near a fundamental pulse rate of the blood perfused tissue.

10. The method of claim 1 wherein the obtaining a measure of a phase difference comprises obtaining the measure of a phase difference at or near a harmonic of a pulse rate of the blood perfused tissue.

11. The method of claim 1 wherein the obtaining a measure of a phase difference comprises obtaining the measure of a phase difference at or near a fundamental or at or near a harmonic of a pulse rate of the blood perfused tissue.

12. The method of claim 1 comprising providing a notification of the presence of venous pulsation.

13. A device for detecting the presence of mixed venous and arterial blood pulsation in tissue, comprising:

means for receiving first and second electromagnetic radiation signals from a blood perfused tissue portion corresponding to infrared and red wavelengths of light;

means for obtaining a measure of a phase difference between the first and second electromagnetic radiation signals;

means for comparing the measure with a threshold value to form a comparison;

means for detecting the presence or absence of venous pulsation using the comparison; and

means for indicating the presence of venous pulsation to a caregiver when venous pulsation is present.

14. The device of claim 13 comprising a filter configured for filtering the first and second electromagnetic radiation signals before obtaining the measure, to pass portions of the first and second electromagnetic radiation signals having frequencies at or near the pulse rate or harmonics of the pulse rate of the blood perfused tissue.

15. The device of claim 13 wherein the means for obtaining a measure of a phase difference between the first and second electromagnetic radiation signals are configured for obtaining a measure of a persistent phase difference between the first and second electromagnetic radiation signals.

16. The device of claim 15 wherein the means for obtaining a measure of a persistent phase difference comprises means for integrating the measure of a phase difference over a time period.

18. The device of claim 13 wherein the means for obtaining a measure of a phase difference is configured for analyzing a cross-correlation function of the first and second electromagnetic radiation signals, as a function of a delay interval between them.

19. The device of claim 13 wherein the means for obtaining a measure of a phase difference is configured for a frequency domain analysis and for subtracting the phases of the first and second electromagnetic radiation signals at a frequency.

20. The device of claim 19 wherein the means for subtracting the phases of the first and second electromagnetic radiation signals is configured for taking the complex conjugate of the first and second electromagnetic radiation signals, and dividing the complex conjugate by the product of the magnitudes of the first and second electromagnetic radiation signals.

21. The device of claim 13 wherein the means for obtaining a measure of a phase difference is configured for obtaining the measure of a phase difference at or near a fundamental or at or near a harmonic of a pulse rate of the blood perfused tissue.

22. The device of claim 13 comprising means for providing a notification of the presence of venous pulsation.

## 10. EVIDENCE APPENDIX

None.

## 11. RELATED PROCEEDINGS APPENDIX

None.